in their fissures, but principally Asan (*Terminalia tomentosa*, W. and A.), Swarm (*Zizyphus rugosa*, Lam.), Sissu (*Dalbergia sissu*, Roxb.), and Abnus (*Diospyros melanoxylon*, Roxb.).

In 1880, Mr. V. Ball, in making a geological survey in the Central Provinces, met with this concretion, and thus alludes to it in his "Jungle Life in India":—"Some white marks on the cut stumps of an Asan tree caught my eye, and these on examination proved to be sections or laminæ of calcareous matter which alternated with the ordinary rings of woody growth. The rocks about were gneisses and schists, and I could discover nothing in the soil to account for the peculiarity. In some cases irregularly shaped pieces seven inches long by two inches thick were met in the trunks at a height of about six feet from the ground. By the natives the lime is burnt and used for chewing with *pan*. On examination it was found there was no structure in these masses which would justify a conclusion that they had been formed by insects. Some included portions of decayed wood seemed to be cemented together by the lime."

Major-General Morgan, late Deputy Conservator of Forests, Madras, speaks of it in the following terms in his "Forestry of Southern India":—"It is a curious fact that in the Wynaad, though there is no free lime in the soil, yet Teak (*Tectona grandis*) and Blackwood (*Dalbergia latifolia*), if wounded near the ground, contrive to absorb large quantities of lime. It may be seen, incrusting the tree on the surface as far as four feet in height, from three inches to a foot in width, and two or three inches in thickness. The lime is so hard that it destroys circular saws, and the Carumburs use it for chewing with betel."

Abel, in 1854, thus described it: "The wood of teak, which grows in the South of India and other tropical countries, frequently exhibits cracks and cavities of considerable extent lined with a white crystalline deposit consisting chiefly of hydrocalcic orthophosphate, $CaHPO_4,H_2O$, with about 11·4 per cent. ammonio-magnesium phosphate" (Chem. Soc. Q.J. xv. 91.)

This white deposit in the wood of teak has also been examined by Thoms, who found it to consist of monocalcic orthophosphate, $CaHPO_4$ ("Landw. Versuchs. St." xxii. 68, xxiii. 413). More recently still Prof. Judd has found in teak a specimen of crystalline apatite, a well-known mineral containing a large proportion of calcium phosphate.

"The formation of this deposit indicates that the wood itself must contain a considerable quantity of phosphoric acid, and the analysis shows this is really the case, as the ash of teak wood is composed as follows:—

CaO	MgO	FeO	K_2O	Na_2O	SiO_2	SO_3	P_2O_5	CO_2	Cl
31·35	9·74	0·80	1·47	0·04	24·98	2·22	29·69	0·01	0·01

The percentages of carbon and hydrogen are higher than in most woods, and this together with the richness in calcium phosphate and silica may perhaps account for the great hardness of teak" (Watts' "Dict. Chemistry," 3rd Supp. p. 1894).

The sample from Nilambúr was in the form of a rounded flattened cake about ten inches in diameter and two or three inches in thickness; dirty white in colour, with a rough gritty surface. A sample was made for analysis by breaking off portions from different parts of the cake and reducing the whole to a fine powder. The powder examined under the microscope was mainly in an amorphous condition similar to prepared chalk, with a dark-coloured gummy matter, and a small quantity of crystalline quartz sand. The following is the composition:—

Calcium carbonate	70·05
Tricalcic orthophosphate	2·89
Quartz sand	9·76
Organic matter	14·30
Moisture	3·00
	100·00

The analysis shows that the principal compound is calcium carbonate, and the concretion approaches nearer the chalk or limestone formation than that of the apatite or phosphatic found by other investigators. An examination of deposits from other trees might show greater differences than these, but it seems enough has been done to prove that the calcium element forms the base.

The sand, probably blown up as dust and made to adhere by the organic matter, is a mechanical ingredient. The deposit contained no salts of sodium or calcium soluble in water, nor any ammoniacal compounds; this would stand to reason, as the heavy rain to which this district is subjected would scarcely leave anything soluble on the trees.

A sample of the soil from the Teak Plantations, the same as that in which the ipecacuanha is being cultivated, has also been examined. It is a light reddish brown sandy loam with quartz. In a dry state it contains 79 per cent. of silica and silicates, about 5 per cent. of organic matter, the same of iron oxide and alumina, and 0·217 per cent. lime as oxide.

The scanty amount of lime present in the soil, and the large amount found in the tree, show what an enormous quantity must have been taken up by the sap. I have shown elsewhere that a full-sized cinchona tree contains about ten ounces of lime (as slaked lime), not concentrated by abnormal development in one place, but distributed in all its parts. A teak tree from its size and ash contents would have a much larger supply than a cinchona, and yet, it seems, is able to excrete it in some abundance. In what manner this takes place is not easy to determine. The calcium enters the plant in a soluble form as sulphate. The calcium unites with oxalic and other acids and is precipitated, while the sulphuric acid parts with its sulphur to form organic compounds. A wound in the tree is liable to render these processes abnormal by causing the vegetable acids to ferment by exposure to the air and to yield carbonic acid as one of the products, and this meeting with the calcium in the ascending sap exuding from the wound might convert it into an insoluble calcium carbonate which would harden in the cavity of the tree and form the deposit.

THE NEW YORK AGRICULTURAL STATION.[1]

THE special report of the Director, Dr. E. Lewis Sturtevant, extends over the first fifty-seven of a volume of 480 pages, and within their limits are to be found the general conclusions arrived at during the past year. The remainder of the *brochure* consists of the detailed reports of the horticulturist, the botanist, and the chemist. After an analysis of the rainfall and temperature of 1887, which appear in general climatic conditions to have borne a great resemblance to what we ourselves experienced, the Director calls special attention to the importance of soil moisture, and surface cultivation as a means of conserving it. He shows the vast importance of checking evaporation from the surface by preserving a finely pulverized condition of the top soil. This he calls a "soil mulch," and states that "it protects the capillary outlets from surface exposure."

"The extent of the conservation of water through the prevention of evaporation by cultivation, as measured by the lysimeters in 1885 from May to September inclusive, with a rainfall of 14·42 inches, as between bare soil and cultivated soil, was about 1·4 inch, and as between cultivated land and sod-land about 2·5 inches. The rational direction, therefore, to the farmer for carrying out intercultural tillages must be to use an implement as a means to an end, *i.e.* the maintaining of a mulch of loose soil upon the field. . . . The intercultural tillage should be applied whenever the upper soil has regained, through the effect of rains, its connection with the lower soil, and the capillary tubes become extended to the surface. Following the same line of argument, the evil effects of weeds are attributed to their appropriation and transpiration of moisture from the soil rather than to their robbing the plant of food constituents. This conclusion will be brought home to anyone who notices the dry condition of the soil in near proximity to tree roots."

The remarks upon feeding cattle with a view to milk and to beef production are interesting, but the system of experimenting upon single animals is not to be commended. The conclusion forced upon the Director, that "individuality is sufficient to mask the influence of food," is patent to anyone, and should demonstrate the absolute need of carrying out any feeding experiments upon a large number of cattle simultaneously. Average results may then be expected upon which practice may be based.

The Director pours a flood of cold water upon the system of plot experiments in the field. Under the head of "Conclusions" he says:—"These field trials indicate the utter unreliability of field experiments, and should convince the public of the lack of certainty which attends all general conclusions gained by this process. I trust the time may arrive when this plat work, instead of being forced upon experiment stations, will be condemned." Certainly

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[1] Sixth Annual Report of the Board of Control of the New York Agricultural Experiment Station (Geneva, Ontario Co.) for the year 1887.

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after obtaining no increase by the application of 1400 pounds of a fertilizer, over what had been obtained from a dressing of 400 pounds per acre, there might appear some cause for complaint. We cannot, however, indorse Dr. Sturtevant's opinions. Plot experiments may be made fairly representative of larger areas, and upon them various treatments of soil and crop may be compared. No doubt great care should be taken in carrying out such experiments; but surely a series of plots of $\frac{1}{4}$, $\frac{1}{10}$, or $\frac{1}{20}$ acre each might be and are made to teach most useful lessons. Dr. Sturtevant might well pause to consider that if such experiments are of no value the value of other experiments might be doubted, and the public, to whom he appeals, might think fit to rescind a grant amounting to £4000 a year for the purpose of carrying out his researches. The volume abounds in tables of analyses of fodder and grain crops. A large portion (200 pages) of the middle is occupied by a descriptive catalogue of varieties of beet, carrot, radish, turnip, onion, celery, spinach, squash, tomato, &c., mostly very wearisome, and savouring more of the catalogue of the seedsman than of the results of scientific work.

Downton. JOHN WRIGHTSON.

SCIENTIFIC SERIALS.

Bulletin de l'Académie Royale de Belgique, January.—Researches on the influence of magnetism and temperature on the electric resistance of bismuth and its alloys with lead and tin, by Ed. van Aubel. These protracted experiments have been undertaken in order to determine the variations of electric resistance due, not only to magnetism and heat, but also to molecular structure, with a view to discovering the causes of the disturbances and completing our knowledge of the phenomena first observed by Hall. In the present paper, a first contribution to the study of the subject, the author deals mainly with the diminution of the electric resistance of bismuth and its alloys. under increased temperature. He shows that the anomaly cannot be due to the presence in the metal of foreign elements such as arsenic, tin, lead, or iron. The state of greater or less tension of the bismuth itself also seems to have no influence. But the study of some bismuth wire obtained by the soldering of the filings of this metal under a pressure of several thousand atmospheres constantly exhibits a considerable increase of resistance when the temperature is raised.—Experimental researches on the vision of the Arthropods, third part, by Felix Plateau. This part deals with the vision of caterpillars, and with the *rôle* of the frontal ocelli in the perfect insects. The very numerous experiments here described and carried out under the most varied conditions, tend to the general conclusion that in insects possessing both compound and simple eyes (ocelli), the former are of some service, while the latter are quite useless, and should consequently be grouped in the category of rudimentary or atrophied organs. In the case of caterpillars the vision is defective, not extending distinctly beyond one centimetre, and is supplemented by the antennæ and the fine hairs covering the body. Perfect insects when completely blinded almost invariably fly in a straight line vertically, which, against the opinion of Forel, is attributed to the more intense light of the higher regions, to which the whole surface of the body is susceptible. The primitive "dermatoptic sensation" is revived, and acts in a feeble way as a substitute for the later developed ocular vision of which the animal has been deprived.—On the molecular work of the organic liquids, by P. De Heen. It is shown that the author's formula of 1882, that for the organic fluids belonging to one and the same homologous series the molecular work is fairly constant, has been mainly confirmed by subsequent research.—This number of the *Bulletin* also contains a valuable paper by Louis Henry on the volatility of the carbon compounds, the result of several years' research.

Rivista Scientifico-Industriale, February 29.—On the peronospora of the grape-vine, by Prof. G. Cuboni. The two phases of this disease are fully described for the first time, and the disease itself is carefully distinguished from black-rot and other analogous forms of blight with which it is often confounded. A mixture of sulphur with 3 or 4 per cent. of the sulphate of copper is proposed as the best remedy if applied at an early stage.—Prof. E. Canestrini concludes his experiments on some effects produced by induction sparks. In one instance the leaves of some perennial plants were found to be covered with dark spots similar to those frequently observed on plants struck by lightning. But the results of these researches, like others of a similar kind, have obviously no more than a relative value, depending as they do on the intensity of the induced currents.

Journal of the Russian Chemical and Physical Society, vol. xix. No. 8.—Isomery in the series C_nH_{2n-2}, by A. Favorsky.—On the laws presiding at reactions of direct addition, by J. Kabloukoff.—Short notes by MM. E. Sokoloff, Joukovsky, and Gorboff.—Experimental researches into the oscillations of electrical force in electrolytes, by A. Sokoloff; it is the third of a series of elaborate papers on the subject, especially with regard to the capacities of voltameters.—On the measuring of specific heat by the method of mixtures at a constant temperature, by N. Hesehus.—End of a full bibliography of all books and articles printed in Russia on chemistry and chemical technology during the year 1886.

Journal of the Russian Chemical and Physical Society, vol. xix. No. 9.—On the speed of formation of acetic ethers of monatomic alcohols, by N. Menshutkin, being a first paper of a new series of researches where the compound influence of the surrounding medium in which the reaction is going on has to be studied.—Notes by MM. Matweieff and Spiridonoff.—On the empirical formula of cholic acid, by P. Latchinoff, being an answer to the criticisms against the new formula ($C_{25}H_{42}O_5$) proposed by the author.—On the gelatinous state of albuminoid bodies, by W. Mikhailoff, being the first of a series of papers intended to summarize elaborate researches on the subject, in accordance with the principles laid down by Lieberkühn and his followers.—On the number of parameters which determine the displacement of a kinematic chain, by P. Somoff. Taking up the view of Reuleaux, who recorded each mechanism as a kinematic chain, the author shows the necessity of considering the degree of freedom left to each part of the chain in its displacements in various mechanisms.—On the dependence of the colour of bodies on the angle of incidence of the rays of light, by W. Rosenberg.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 15.—"Report of the Observations of the Total Solar Eclipse of August 29, 1886, made at Grenville, in the Island of Grenada." By H. H. Turner, M.A., B.Sc., Fellow of Trinity College, Cambridge. Communicated by the Astronomer-Royal.

The first part of the paper gives details of the general arrangements made for observation—the selection of a site, the erection of the instruments, and a hut to cover them; and refers to the unfavourable conditions under which the observations were made. The second part gives the results of the observations. These were of two kinds.

(1) Before and after totality the order of appearance and disappearance of a number of bright lines in the spectrum of the chromosphere and inner corona was watched. The lines selected were those observed by Mr. Lockyer in the Egyptian eclipse of 1882, and the observations were undertaken with a view to the confirmation of his results.

The lines are denoted for convenience by small letters as follows:—

	λ.		λ.		λ.
a	4870·4	*e*	4917·9	*h*	4932·5
b	4871·2	*f*	4919·6	*i*	4933·4
c	4890·0	*g*	4923·1	*k*	4956·5
d	4890·4			*l*	4970·0

With this nomenclature, a table given by Mr. Lockyer in a short account of his results (Roy. Soc. Proc., vol. xxxiv., 1883, pp. 291, &c.) shows that lines *g* and *l* are seen by Tacchini in prominences, while *a*, *b*, *c*, *d*, *e*, *f*, and *k* are seen in spots.

Mr. Lockyer saw *g* and *i* 7 minutes before totality,
and in addition *k* and *l* 3 ,, ,,
and all the lines 2 ,, ,,

In my own observations I saw *g* 3 minutes before totality,
and in addition *i* 40 seconds ,,

while the moment of appearance of all the lines was indistinguishable from the commencement of totality.

After totality clouds obscured the sun for a short time; but on their clearing the visibility of *g* and *k* was noted; *i* could not be seen.

The three lines *g*, *i*, and *k* were extremely short, and did not

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